

## Insight Into Neurocognitive Dysfunction in Schizophrenia

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**Insight into psychotic symptoms is typically poor in schizophrenia; however, it is not known whether insight into neurocognitive impairment is similarly impaired. Most people with schizophrenia experience cognitive dysfunction, and the deficits in attention, memory, and critical thinking have been associated with poor functional outcome. As new treatments are developed for the cognitive impairments, it will be important to know whether patients will be receptive to yet another therapy. Insight is an important factor in treatment compliance and treatment outcome; however, it is not known if patients have insight into their cognitive dysfunction. In order to assess insight into neurocognitive dysfunction, 75 subjects were administered the Measure of Insight into Cognition—Clinician Rated, a newly created measure based on the Scale to Access the Unawareness of Mental Disorder, that assesses insight into cognitive impairment. Subjects were also administered the Brief Assessment of Cognition in Schizophrenia and Independent Living Scale—Problem Solving to objectively assess neuropsychological status and problem-solving skills needed for independent living. Results demonstrated that virtually all subjects had cognitive impairment, yet insight into their neurocognitive symptoms was limited. This finding has potential implications for treatment programs seeking to improve cognitive functioning in schizophrenia**

*Key words:* awareness/insight/cognition

### Introduction

Individuals diagnosed with schizophrenia spectrum disorders have significant cognitive deficits, especially in the areas of attention, memory, and problem solving.<sup>1</sup> Because these cognitive deficits have been linked to poor functional outcome,<sup>2,3</sup> there is considerable interest

in developing treatments for cognitive impairments. As pharmacological and behavioral therapies become more widely available, it will be important to know if patients understand the need for the treatment. Insight into psychotic symptoms, including appreciation of the need for treatment, is strongly correlated with psychosocial functioning and compliance with treatment.<sup>4–6</sup> It is reasonable to hypothesize that many of these findings about insight into psychotic symptoms would be applicable to cognitive dysfunction and its treatment in schizophrenia. For example, poor insight into neurocognitive dysfunction could be associated with noncompliance with cognitive remediation or cognitive enhancing medications. Therefore, it becomes relevant to understand whether people with schizophrenia have insight into their cognitive deficits. Unfortunately, this is a poorly understood construct.

To date, most studies of insight in schizophrenia have focused on psychotic symptoms. Research has indicated that insight into psychotic symptoms is generally poor,<sup>7</sup> may wax and wane alongside psychotic symptoms, but in the most ill patients remains poor even after clinical stabilization.<sup>8,9</sup> Awareness of mental illness can improve, while recognition of the need for treatment is less mutable.<sup>10</sup>

Multidimensional models of insight are the “gold standard” of existing approaches to quantifying insight into psychotic symptomology in schizophrenia.<sup>9</sup> Scales developed according to these models cover 3 key areas: awareness of illness, awareness and attribution of symptoms, and awareness/cooperation with need for treatment. The clinician-rated Scale to Assess the Unawareness of Mental Disorder (SUMD)<sup>7</sup> and the self-report Insight Scale proposed by Birchwood et al<sup>11</sup> assess these 3 key areas of insight and also measure insight on a continuum, in recognition of the fact that it is possible to have partial insight into the presence of psychotic symptoms. Both measures address only the positive and negative symptoms of schizophrenia; there is no scale that uses a multidimensional formulation of insight to assess insight into neurocognitive deficits among schizophrenia spectrum patients.

In order to measure insight into cognitive symptoms, we developed a scale, Measure of Insight into Cognition—Clinician Rated (MIC-CR), which is a clinician-rated interview that examines insight into cognitive deficits, focusing on the areas of known impairments, which

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include attention, memory, and problem solving.<sup>1</sup> While other cognitive impairments are recognized and assessed in schizophrenia,<sup>12</sup> the MIC-CR focuses on attention, memory, and problem solving because they are commonly impaired, linked to functional outcome and the target of pharmacologic and behavioral therapies. As with the SUMD, the MIC-CR seeks to measure degree of insight into cognitive deficits from a multifaceted perspective, examining awareness of cognitive deficits, as well as the attribution of cognitive deficits to mental illness.

There is a small literature that addresses awareness of neurocognitive deficits in schizophrenia and other psychiatric disorders. Most of the evidence suggests psychiatric patients lack such awareness. To wit, self-report of attention dysfunction was not related to objective deficits on the Continuous Performance Task in 21 people with schizophrenia and 16 depressed patients.<sup>13</sup> Moritz et al<sup>14</sup> reported that while clinician report was slightly better than self-report in assessing neurocognitive status, neither measure was accurate in assessing cognitive functioning. These authors examined 148 psychiatric inpatients with schizophrenia, depression, and anxiety disorders, utilizing an array of neuropsychological tests and the Fragebogen erlebter Defizite der Aufmerksamkeit; Questionnaire for Self-Experienced Deficits of Attention (FEDA), a 22-item, German, self-report questionnaire that focuses on attention skills needed in daily life.<sup>15</sup> Keefe et al<sup>16</sup> found that patient report of cognitive dysfunction did not correlate to neuropsychological functioning as measured by objective tests, although coupling informant reports with patient report boosted accurate prediction of cognitive and real world functioning on the Schizophrenia Cognition Rating Scale (SCoRS), an interview-based assessment of cognition.

Medalia and Lim<sup>17</sup> compared the self-report, clinician ratings, and neuropsychological test results in the cognitive domains of attention, nonverbal memory, and verbal memory from 185 outpatients diagnosed with schizophrenia or schizoaffective disorder. Using the Work-Readiness Cognitive Screen, a web-based cognitive screening tool, over half of participants were classified as impaired in memory and attention, yet 40% of these same impaired patients did not perceive that they had any cognitive difficulties. Clinician ratings of cognitive status were only slightly more accurate than those of the participants.

Clinicians who use clinical ratings to assess neuropsychological impairment are not very accurate in their assessments. Harvey et al<sup>18</sup> found minimal relationship between performance of young and elderly schizophrenia patients on neuropsychological tests and clinician ratings on Positive and Negative Syndrome Scale (PANSS) questions about conceptual disorganization, blunted affect, poor rapport, stereotyped thinking, tension, mannerisms and posturing, disorientation, attention, and judgment and insight.

Two articles suggest that patients are sometimes able to recognize when they have cognitive difficulty. Stip et al<sup>19</sup> administered the Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS), a 21-item, self-report Likert type scale that asks patients to rate frequency with which they may experience problems in concentration and memory, to 114 individuals with schizophrenia, schizophreniform disorder, or schizoaffective disorder. They found modest but significant correlations between patient ratings of frequency of problem and degree of neuropsychological impairment evidenced on objective tests. Sanjuan et al<sup>20</sup> did not give objective tests of neuropsychological functioning, but rather compared patient and caregiver (most often parent) report of cognitive difficulty and found some congruence of opinion.

This literature points to the limited awareness both patients and clinicians have about the cognitive dysfunction associated with schizophrenia. While self-report and clinician-rated interviews inform awareness, they do not necessarily encompass insight into cognitive deficits. This investigation set out to understand insight into neurocognitive problems in schizophrenia using a multifaceted perspective and utilized a novel rating scale based on the SUMD, to examine awareness of cognitive deficits, as well as the attribution of cognitive deficits to mental illness. Furthermore, we chose to compare self-perception of cognitive dysfunction to actual neuropsychological performance, as opposed to informant rating. We included 2 types of neuropsychological measures, one with more obvious ecological validity, in order to assess the possibility that congruence between self-perception of cognition and actual cognitive skills needed for everyday life would be better than the congruence between self-perception and cognitive skills needed for test performance.

## Methods

### *Subjects*

A total of 75 participants were recruited from outpatient and inpatient psychiatry services affiliated with Albert Einstein College of Medicine in Bronx, NY. All participants were between the ages of 18 and 60, carried a Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) diagnosis of schizophrenia, as confirmed by chart review and administration of modules B, C, and E of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I Clinician Version) interview. Selected questions from module A were used to determine the potential presence of a mood disorder. During the interview, if the subject positively endorsed any of the selected SCID mood disorder questions, a full module A was administered at that time. With this information, when determining etiology of the psychiatric symptoms in module C, it was possible to rule out the presence of schizoaffective disorder.

Participants receiving any type of pharmacotherapy, psychotherapy, or mental health care were invited to participate in this study. Individuals who were non-English speaking or had mental retardation, dementia, central nervous system disease, history of traumatic brain injury (TBI), or a primary diagnosis of substance abuse were excluded. All subjects provided written informed consent, witnessed by a mental health worker unaffiliated with this research study, as per Institutional Review Board (IRB) guidelines. Data reported here were obtained as part of a larger study examining insight in schizophrenia.

### Measures

The following measures were administered to all subjects.

*Structured Clinical Interview for DSM-IV Axis I Disorders.* The SCID-I is a semi-structured interview used for diagnosing major Axis I disorders. Participants were administered modules A, B, C, and E.

*Measure of Insight Into Cognition—Clinician Rated.* The MIC-CR was created to assess patients' ability to verbalize their relative cognitive status in the areas of attention, executive functioning, and memory (see Appendix A). The process of method development to choose the specific items within each domain and select the best wording for these items was done by first creating a larger pool of potential items and then piloting them with 3 neuropsychologists, who rendered an opinion as to whether the question tapped the designated neuropsychological function, and with patients who rendered an opinion on understandability and comprehensibility. Ultimately 12 questions were chosen, which assess both awareness and attribution of the aforementioned cognitive domains. From the MIC-CR, composite scores of participants' awareness and attribution of cognitive impairments were arithmetically calculated. Additionally, subscale scores were calculated for awareness in the domains of attention, executive functioning, and memory. On the MIC-CR, clinicians rate patients on a continuous 5-point scale similar to that used in the SUMD<sup>7</sup> where a score of 1 indicates full insight, a score of 3 indicates partial insight, and a score of 5 indicates no insight. Attribution of illness is queried if the awareness score is 1–3, and it is also rated on a continuous 5-point scale where a score of 1 indicates attribution of the symptom to the mental illness, a score of 3 indicates partial attribution to the mental illness, and a score of 5 indicates the individual does not think the symptom is related to a mental disorder. Therefore, the MIC-CR represents a continuous and multifaceted approach to assessing insight into cognitive symptoms in schizophrenia.

*Brief Assessment Into Cognition in Schizophrenia.* The Brief Assessment into Cognition in Schizophrenia

(BACS) was developed for clinical trials where assessment of cognition in schizophrenia is required.<sup>21</sup> It is a 35-minute, largely paper and pencil test that assesses the aspects of cognition found to be most impaired and most strongly correlated with outcome in schizophrenia, namely, executive functioning, problem solving, attention, and memory. The BACS provides a composite score of overall cognitive functioning, as well as *z* scores on 6 subtests that measure functioning in the aforementioned cognitive domains.<sup>21</sup> We converted the *z* scores to *t* scores as per standard conventional guidelines.<sup>22</sup>

*Independent Living Scale—Problem Solving.* The Independent Living Scale—Problem Solving (ILS-PS) is a functional measure which assesses problem solving in everyday life situations, with a particular focus on independent living skills.<sup>23</sup> The ILS-PS has demonstrated efficacy in assessing cognitive status as it affects functional outcome in a schizophrenia population<sup>24,25</sup> with performance on the ILS-PS largely predicted by neurocognitive skill level.<sup>25</sup>

*Wide Range Achievement Test—Third Edition, Reading Subtest.* The Wide Range Achievement Test—Third Edition, Reading Subtest (WRAT-3), reading subtest is a word recognition test which is recognized as a valid way to estimate premorbid IQ.<sup>26</sup>

### Procedure

All subjects were referred to this study by their treating therapist, and review of their medical records confirmed that inclusion/exclusion criteria were met. Subjects were then asked to participate, and once consented as per IRB guidelines, they underwent a brief semi-structured clinical interview with portions of the SCID-I, to confirm diagnosis of schizophrenia and exclude presence of substance use or affective disorder. Participants not meeting criteria for a diagnosis of schizophrenia or who had active substance dependence diagnoses were released from the study with partial compensation. Remaining subjects completed a one-session assessment that included various measures of insight, cognition and psychiatric status; measures relevant to this study are explained above. All subjects were given a semi-structured interview (PANSS) to evaluate the severity of positive and negative symptoms of their schizophrenia spectrum disorder. Subsequently, measures of neurocognitive functioning were administered in this order: WRAT-3 reading subtest, BACS, ILS. Next, insight into neurocognitive deficits was assessed according to standardized instructions in the MIC-CR manual.

The assessments were administered by either a predoctoral graduate student or 3 postdoctoral fellows, all of whom participated in training and reliability sessions conducted for all study measures. Interrater reliability data for the MIC-CR from the 4 raters in the study

are not available; however, an estimate of interrater reliability using Pearson correlation coefficient of assessments of awareness made by 2 raters on the same subject was significant ( $r = 0.94$ ,  $P < .01$ ), indicating moderate or good agreement beyond that expected by chance. Actual agreement among examiners on the 12 items was 75%; sum of item ratings was identical between the raters.

### Statistical Analysis

Performance on the BACS was used to identify whether subjects had cognitive impairment. A cutoff  $z$  score of less than  $-1.35$  was chosen to indicate cognitive impairment for 2 reasons:

1.  $z$  scores equal or less than  $-1.35$  are in the borderline to impaired range for the general population and thus commonly considered to evidence absolute weakness;
2. Across studies of cognitive performance in people with schizophrenia, average  $z$  scores typically fall less than  $-1.35$  and are considered evidence that people with schizophrenia have cognitive impairment.<sup>1,2,3,27</sup>

Based on meeting any one of the following criteria, 71 of 75 subjects were identified as cognitively impaired.

Global: BACS total  $t$  score less than  $-1.35$  SD (69% of SS) and/or WRAT-3  $t$  score – BACS total  $t$  score  $\geq 0.7$  (63% of participants). A total of 83% of the 71 participants met the global criteria.

Attention: less than  $-1.35$  digit sequencing and/or symbol coding BACS subtest (41% of participants).

Memory: less than  $-1.35$  verbal memory BACS subtest (94% of participants).

Executive functioning: Less than  $-1.35$  tower of London and/or verbal fluency BACS subtest (66% of participants).

Because, the majority (95%) of subjects were cognitively impaired, and because the intent of the study was to understand insight into existing neurocognitive deficit, and not awareness of cognitive status, we excluded the 4 subjects without cognitive impairment from subsequent analyses.

Statistical analyses were performed to confirm the reliability and validity of the MIC-CR. Through a factor analysis using the Principal Components Analysis extraction method, examination of factor loadings, and Cronbach's alpha, the MIC-CR was assessed for content validity and internal reliability. We were unable to measure convergent validity because all of the existing measures of awareness were either unavailable at the time the study was conducted (Grupo Espanol para la Optimización Y Tratamiento de la Esquizofrenia, GEOPTE: 2003 and SCoRS: 2006), were in another language (SSTICS: 2003 and FEDA: 1991), or were narrow in cognitive focus.<sup>13</sup>

We did a box score analysis of levels of insight as assessed by the MIC-CR and applied this to the total score and subscale attention, memory, and executive functioning

**Table 1.** Demographics and Clinical Characteristics ( $N = 71$ )

Variable	Mean (SD)
Age	38.90 (11.40)
Years of education	11.49 (2.29)
Gender	
Male	52 <sup>a</sup>
Female	19
Ethnicity (AA/H/C/A/O)	41/21/6/2/1 <sup>a</sup>
Dx paranoid/disorganized/undiff/resid	47/4/17/3 <sup>a</sup>
Age of first hospitalization	22.49 (7.78)
Number of psychiatric hospitalizations	6.02 (5.41)
Positive PANSS $t$ score	51.73 (9.00)
Negative PANSS $t$ score	44.76 (10.43)
General PANSS $t$ score	47.55 (11.01)

<sup>a</sup>Number of subjects.

scores. Because not all subjects were impaired on the ILS-PS and we were interested to see whether self-perception was in agreement with objective assessment of ecologically valid cognitive skills, a Kappa analyses was performed to assess concordance between patient perception of cognitive impairment on the MIC-CR and their ILS-PS test results. We also used the whole sample of 75 subjects in a Kappa analysis to look for agreement between actual cognitive status and perception of cognitive status.

## Results

### Sociodemographic Characteristics

A total of 75 subjects participated in this investigation; 60 subjects were outpatients and 15 were inpatients. Demographic characteristics for the 71 subjects (56 outpatients/15 inpatients) whose data were analyzed are presented in table 1. This was a largely male sample of adults with about 11 years of education, who were first hospitalized in their early 20s and subsequently had on average 6 psychiatric hospitalizations.

### Premorbid and Current Cognitive Functioning

Premorbid level of intellectual functioning for the 71 cognitively impaired subjects was estimated to be in the low average range, based on mean performance on the WRAT-3 reading test ( $T = 43.25$ ,  $SD = 8.61$ ). Current cognitive functioning as measured by the BACS mean total score ( $T = 32.03$ ,  $SD = 8.16$ ) was low relative to premorbid IQ and the general population, indicating neuropsychological impairment. A paired sample  $t$  test indicated that estimated premorbid IQ as measured by the WRAT-3 reading test was significantly higher than current cognitive status, as measured by the BACS total  $t$  score ( $t[70] = 8.66$ ,  $P < .0000$ ), further suggesting that there

**Table 2.** Neuropsychological Functioning

Variable	Mean (SD)
BACS verbal memory <i>t</i> score	24.15 (9.20)
BACS digit sequencing <i>t</i> score	40.27 (8.67)
BACS token motor task <i>t</i> score	40.46 (9.81)
BACS verbal fluency <i>t</i> score	37.03 (10.50)
BACS symbol coding <i>t</i> score	39.72 (6.56)
BACS tower of London <i>t</i> score	40.00 (12.62)
BACS total <i>t</i> score	32.03 (8.16)
ILS-PS standard score	35.23 (11.19)
WRAT <i>t</i> score	43.25 (8.61)

was cognitive decline for this group of subjects. Subjects also performed below expectations on a measure of daily problem solving; the mean ILS-PS score was  $T = 35.23$  ( $SD = 11.19$ ). In general, our sample population performed approximately 1–1.5 SDs below normal range on the various components of this neuropsychological screening battery, which is consistent with expectation for this population. Scores on the cognitive tests are listed in table 2.

### Test Sensitivity

In this investigation, we used the MIC-CR, a new measure, to assess insight into cognitive dysfunction. Internal consistency for the MIC-CR was calculated using Cronbach's alpha coefficient and found to be .87. An examination of the contribution of the individual items to the total scale score indicated that the deletion of any one of the items on the MIC-CR would not have diminished the overall internal consistency of the scale.

A factor analysis with oblique rotation was performed to further understand the relationship between the items in the MIC-CR. Table 3 shows the 3 factors with eigenvalues over 1 that were identified. Factor 1 had an eigenvalue of 4.9 and accounted for 41% of the variance; factor 2 had an eigenvalue of 1.4 and accounted for 12% of the variance, while factor 3 had an eigenvalue of 1.02 and accounted for 8.5% of the variance. Items on the MIC-CR appeared to be highly interrelated and correlated with one another, and the fact that all items loaded on the first factor which accounted for the bulk of variance suggests that patients largely perceive cognition as a unitary construct. The 2 smaller factors likely reflect method factors or possibly may point to some patient reported patterns of cognitive deficit. Factor 2 captured elements of executive dysfunction related to initiation, organization, and completion of tasks, whereas factor 3 captured concentration and working memory.

### Awareness and Attribution of Cognitive Deficit

On the MIC-CR, the mean overall awareness of cognitive dysfunction score was 3.40 ( $SD = 1.11$ ), based on a continuous scale from 1 to 5, with 1 indicating good aware-

ness, 3 indicating partial awareness, and 5 indicating poor awareness of cognitive deficits. The mean subscale scores for the MIC-CR were as follows: attention ( $x = 3.19$ ,  $SD = 1.36$ ), memory (3.42, 1.3), and executive functioning (3.54, 1.24). As a group, the subjects demonstrated partial awareness of cognitive dysfunction both overall and within cognitive domains.

On the MIC-CR total score, 27% of subjects reported full insight into their cognitive dysfunction, while 21% reported partial insight, and 52% reported no insight into their relative cognitive dysfunction. Levels of insight for the MIC-CR attention, memory, and executive functioning subscales are reported in table 4. Approximately half of the individuals with schizophrenia in this sample had no insight into their relative cognitive dysfunction, something the average group scores did not convey. Length of illness was not significantly correlated with level of insight into cognitive dysfunction ( $r = 0.09$ ).

Attribution of cognitive deficit to a mental illness is also assessed by the MIC-CR, for those people who identify cognition as a problem. Sixty-six subjects showed some awareness of cognitive dysfunction and were asked if they thought it was due to mental illness. The group mean for these 66 subjects was 3.30 ( $SD = 1.33$ ) based on a continuous scale from 1 to 5, with 1 indicating full attribution to mental illness, 3 indicating partial attribution, and 5 indicating no attribution of cognitive deficits to mental illness. As a group, the subjects demonstrated partial ability to attribute cognitive dysfunction to a mental illness. A breakdown of actual attribution scores indicates how diverse subjects were in their ability to attribute cognitive dysfunction to mental illness. Of the 66 subjects asked about attribution, 26% indicated that cognitive dysfunction was fully attributable to mental illness, whereas 35% and 39% of subjects verbalized partial or no attribution of cognitive dysfunction to mental illness.

The relationship between awareness and attribution of cognitive dysfunction was examined. There was a significant correlation between awareness of cognitive deficit and attribution to mental illness ( $r = 0.41$ ,  $P = .001$ ), indicating that people who were more aware were also more likely to attribute their problems to a mental illness. A Kappa analysis which examined agreement between viewing oneself as impaired and attributing it to mental illness indicated that people with good awareness of having cognitive problems had a small tendency to attribute the problems to mental illness (Kappa = 0.23,  $P = .057$ ). Of the 29 subjects with good awareness of cognitive dysfunction as indicated by a MIC-CR awareness score of 1–3, 17 subjects (59%) fully attributed the problems to mental illness (score 1–3) and 12 (41%) subjects had partial to no attribution to mental illness (score 3.1–5). The majority (24) of the 37 subjects with limited awareness of cognitive dysfunction, as evidenced by scores greater than 3, also had limited ability to attribute cognitive dysfunction to a mental illness. Of the 66 subjects who

**Table 3.** MIC-CR Factor Analysis—Loadings

Question	Factor 1	Factor 2	Factor 3
Awareness of difficulty remembering where you placed objects of importance	0.716		
Awareness of difficulty paying attention because mind often drifts and misses out on important information	0.683		
Awareness of being very forgetful about what has been said, done, or read in the last 24 h	0.683	0.110	
Awareness of difficulty thinking through possible solutions to problems	0.683		0.322
Awareness of difficulty being organized	0.676	0.510	
Awareness of trouble listening and paying attention	0.650		
Awareness of being easily distracted from tasks by background noises or activities	0.642		
Awareness of intending to do things but often forget	0.640	0.179	
Awareness of difficulty focusing on the task at hand	0.634		0.389
Awareness of trouble remembering information like names, directions, and/or dates	0.607	0.259	
Awareness of difficulty working on more than one task at a time	0.530		0.438
Awareness of difficulty initiating and completing tasks	0.519	0.620	0.257
Eigenvalue	4.9	1.4	1.02

perceived any cognitive impairment, 36 (55%) had partial to no attribution of the cognitive deficit to mental illness.

#### Test Specificity

In order to determine whether the MIC-CR is measuring insight specifically for cognitive functioning, as opposed to more general insight, the MIC-CR Total Awareness of Symptoms score and the MIC-CR Total Attribution to Mental Illness score were each correlated with the score on PANSS—G12. G12 measures lack of judgment and insight, based on questions about reasons for treatment and whether the person believes they have a psychiatric or mental problem. Both correlations were insignificant; insight into cognitive deficit is not significantly associated with insight into psychiatric illness.

#### Insight Into Neurocognition

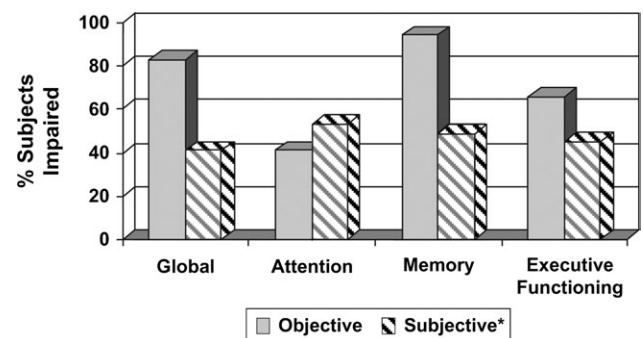
In order to further determine if individuals with schizophrenia were able to correctly perceive cognitive impairment, the percentage of patients with objectively impaired cognition on the BACS Total Score, Attention, Memory, and Executive Subscale Scores was compared

with the percentage reporting perceived impairment on the MIC-CR. These results, which are presented in figure 1, indicate that less than half of the subjects with global or memory impairment perceived a problem, and about two-thirds of patients with executive dysfunction perceived a problem. Interestingly, more patients reported a problem with attention, than actually had objective impairment.

To assess the relationship between neurocognitive insight and an ecologically valid measure of cognitive functioning, a kappa analysis was performed to assess agreement between problem-solving abilities required for independent living as measured by the ILS-PS and perception of cognitive abilities on the MIC-CR. A ILS-PS *t* score below 40, which is in the “low” range,<sup>23,24</sup> indicated that problem-solving skills needed for independent living were impaired, while a *t* score of 40 or above, which fell in the “moderate to high” range,<sup>23,24</sup> indicated that the problem-solving skills needed for independent living

**Table 4.** Percent of Subjects Showing 3 Levels of Insight Into Neurocognitive Deficit

	Level of Awareness		
	Full (%)	Partial (%)	None (%)
MIC-CR total score	27	21	52
MIC-CR attention	42	16	42
MIC-CR memory	30	24	46
MIC-CR executive functioning	28	20	52

**Fig. 1.** Objective compared to subjective cognitive impairment: BACS and MIC-CR. \*Subjective Impairment: MIC-CR Awareness Score 1–3

were generally intact. No agreement was found between perceived cognitive dysfunction on the MIC-CR and the cognitive skills needed for independent living on the ILS-PS ( $\kappa = -0.07$ ,  $P = .49$ ). Correlations between ILS scores and the MIC-CR awareness ( $r = -0.18$ ) and attribution scores ( $r = -0.14$ ) were not significant.

#### *Relationship Between Insight Into Cognitive Deficit and Clinical and Cognitive Variables*

A series of correlations examined the relationship between clinical symptoms as measured by the PANSS and insight into cognitive dysfunction as measured by the MIC-CR. After correcting for multiple comparisons, only the correlations between anxiety G2 and awareness ( $r = -0.41$ ,  $P < .000$ ), depression G9 and awareness ( $r = 0.46$ ,  $P < .000$ ), and depression  $t$  score and awareness ( $r = -0.431$ ,  $P < .000$ ) reached significance, indicating that subjects with more anxiety and depression were more likely to have greater awareness of cognitive dysfunction.

In order to address the possibility that awareness of cognitive deficit is related to degree and or type of cognitive impairment, a series of correlations examined the relationship between cognitive symptoms as measured by the BACS and insight into cognitive dysfunction as measured by the MIC-CR. No significant correlation was found between performance on any of the BACS subtests or BACS total score and scores on the MIC-CR. Further analyses with one-way analyses of variance were done to investigate whether MIC-CR scores differed as a function of whether the BACS total or BACS verbal memory  $t$  scores fell in the ranges of 10–30, 31–40, or 41–50. There were no significant differences in the MIC-CR total scores for subjects classified in these 3 groups. When the group classification was changed to BACS  $t$  scores in the ranges of 10–30, 31–35, 36–50, there remained no significant difference in MIC-CR scores.

In order to assess whether awareness of cognitive status is inherently a difficult task, a kappa analysis was done to assess agreement between the MIC-CR and performance on the BACS total score. Here, all 75 subjects were used, and impaired cognition was defined as a total BACS score  $< 1.35$  SD. The kappa =  $-0.067$  was not significant, indicating very poor agreement between objective rating of cognitive ability and awareness of cognitive status. Of the 16 subjects classified as unimpaired, half rated themselves as cognitively impaired on the MIC-CR.

## **Discussion**

This is the first study we know of to approach the study of insight into neurocognitive dysfunction from a multidimensional perspective. Using the MIC-CR, a new instrument that was created to mirror the SUMD,<sup>7</sup> we compared clinician-assessed insight to actual cognitive performance on the BACS and found that patients

with schizophrenia are about as likely to have no insight as to have any insight into their neurocognitive deficits. Using the tenets of insight into illness delineated by the SUMD, the MIC-CR was able to assess both awareness and attribution of cognitive dysfunction in schizophrenia and ascertain that about half of the sample had no awareness of cognitive problems, and of those who did have awareness, 59% attributed their cognitive dysfunction to mental illness.

Typically, the main areas of cognitive impairment seen in schizophrenia involve the domains of attention, memory, and executive functioning, although a decline on general measures of cognitive functioning is also evident.<sup>1,27</sup> Therefore, the MIC-CR was created to assess awareness of cognitive impairment in the areas of attention, memory, and executive functioning; overall perception of functioning was assessed through a total score that combined subscales. The MIC-CR was found to have a high internal consistency reliability, which was further confirmed by a factor analysis that revealed one large common factor, which accounted for a sizeable amount of variance. Analysis of the content validity of the MIC-CR through a factor analysis demonstrated one large factor containing all 12 items, as well as 2 much smaller factors. It appears that individuals with schizophrenia tend to view cognition as a unitary construct, without necessarily clustering skills into the commonly recognized neuropsychological domains. To the extent that they differentiate between domains of cognitive functions, they cluster the abilities to initiate, organize, and complete tasks, and they also cluster the abilities to multitask, stay focused, and think through problems.

In order to ascertain whether people with schizophrenia have insight into their cognitive dysfunction, we assessed subjects with demonstrable cognitive impairment relative to the normal population and/or estimated premorbid intellectual functioning. Results revealed that subjects in this investigation had a mean estimated premorbid IQ in the low average range. Overall current cognitive performance as assessed by the BACS was impaired relative to a healthy population and to the estimated premorbid IQ of the subjects. Of note, on a test of verbal memory functioning, subjects' performance was most impaired. The cognitive functioning of this sample is essentially congruent with what is known about people with schizophrenia, namely, that they have neurocognitive deficits and memory is often a pronounced area of impairment.<sup>2</sup>

Whereas, every subject in the data analysis evidenced some cognitive impairment on objective testing, less than half of those subjects with global or memory impairment perceived a problem, indicating that awareness of deficit is poor. The average awareness score on the (MIC-CR) indicated that subjects in our investigation had partial insight into neurocognitive dysfunction; however, a breakdown of subjects by actual level of

awareness indicated that subjects were as likely to have no awareness of neurocognitive dysfunction as to perceive any problem. This is all the more striking given that all subjects took the BACS, a cognitive test, hour(s) before being asked about their perceptions of their cognitive abilities. Thus, they had just had an opportunity to test their memory, attention, and reasoning, which arguably should have maximized their awareness of their cognitive skills, yet many evidenced poor awareness of their cognitive abilities.

To further examine insight into neurocognitive deficits, we considered if performance on an ecologically valid test of problem solving was better at capturing the deficits perceived by patients. However, there was no agreement between subject perception of cognitive dysfunction and actual performance on problem-solving tasks needed for independent living. Thus, subjects who were classified as too cognitively impaired to be able to live independently were unlikely to have awareness of their cognitive deficits. These results further demonstrate the importance of having neuropsychological testing to determine neurocognitive status in individuals with schizophrenia. The MIC-CR is a useful tool to understand level of insight in schizophrenia but cannot be used as a substitution for objective neuropsychological assessment.

The findings of this study are consistent with previous research involving awareness of cognitive deficits in schizophrenia<sup>13,14,17</sup> and in other populations. Research has demonstrated poor awareness of cognitive functioning in patients with TBI, Alzheimer's disease, multiple sclerosis, epilepsy, and Korsakoff's syndrome.<sup>28–32</sup> If, as this study suggests, people with schizophrenia have poor insight into their cognitive deficit, the question arises as to why. Theories as to the etiology of poor insight into psychosis have focused on the possibility that poor insight is a primary feature of psychosis, that it is the result of neuropsychological deficit, or that it relates to a coping style which features defensiveness.<sup>33,34</sup> The data from this study did not support a relationship between severity of psychotic symptoms and insight or between any type or degree of cognitive dysfunction and poor insight into cognitive deficit. Future research would be needed to address whether coping style is related to insight into cognitive impairment.

It is also possible that poor insight into cognitive dysfunction has a different etiology from poor insight into psychosis. In healthy individuals, self-perception of cognitive ability is often flawed,<sup>35</sup> suggesting that the task of self-assessment, particularly as it relates to skill-based performance, is an intrinsically difficult endeavor. The challenge of skill-based self-assessment was highlighted in this study by the finding that half of the few subjects who did not have cognitive dysfunction rated themselves as being cognitively impaired. Research with larger samples of cognitively unimpaired schizophrenia patients, and comparisons with healthy subjects, might address

the possibility that insight into cognitive dysfunction is no worse than insight into cognitive ability.

This study indicates that people with schizophrenia have limited insight into cognitive dysfunction. One limitation of this study is that several raters obtained the data on insight, and we only did preliminary analyses of interrater reliability. Once we understand the extent and basis for the poor insight, we will be better able to develop treatments to improve self-awareness. In this regard, it is of interest that length of illness was not significantly related to degree of insight. Thus, we found no evidence that awareness of cognitive deficit was greater in people who were closer to the onset of the disorder.

The findings that subjects with greater depression and anxiety were more likely to have better awareness of cognitive dysfunction are consistent with previous reports of an association between better insight into psychosis and mood.<sup>10</sup> Some authors have suggested that awareness of illness and its consequences can be stressful and demoralizing<sup>36</sup>; our data point to an association between depression and insight but does not clarify directionality or causality.

We sought to expand previous work by assessing not only awareness but also insight and therefore used the same multidimensional model of insight that is applied to studies of insight into psychotic symptoms. As such, the MIC-CR was modeled directly from the SUMD to capture awareness and attribution of cognitive impairments.<sup>7</sup> This allowed for a determination that attribution of cognitive deficit is impaired in schizophrenia. While the mean score for the group suggested a partial ability to attribute cognitive dysfunction to mental illness, a breakdown of subjects by level of attributional ability indicated that 39% of those subjects who had any, even minimal awareness of cognitive dysfunction were unable to attribute it to mental illness. The administration of the MIC-CR includes instructions for the clinician to state, "Problems with (designated cognitive function) can sometimes be caused by mental illness, do you think that is the case for you?" Thus, almost 40% of the subjects were in essence overlooking an explanation that was being offered to them. The kappa analysis indicated a low level of agreement between awareness and attribution, which further supports the evidence of limited insight in this population. Attribution is an important component of insight because it implies a fuller understanding of the impact that a disease has on functioning. This research indicates that many patients lack a full understanding of how their illness affects them.

#### *Future Directions*

The findings of our investigation demonstrated that individuals with schizophrenia for the most part have limited insight into their neurocognitive status. As more treatments regimens in schizophrenia are being targeted at



remediating the cognitive impairments associated with the disorder, it becomes important for researchers as well as practitioners to be aware of the patients' lack of insight in this area. Patients may be unclear as to what they are being treated for and this lack of insight may lead to decreased motivation for treatment.

As the clinical and functional implications of poor insight into psychotic illness have become better understood, attention has shifted to the importance of clinical interventions to improve insight.<sup>4</sup> Psychoeducational interventions seek to teach patients that the psychotic symptoms they are experiencing are in fact part of a constellation, which comprises their mental illness. In addition, psychoeducational interventions have stressed the importance of medication adherence. However, the focus of psychoeducation is psychotic symptoms, and it is rare for the cognitive symptoms of schizophrenia to be discussed. With the findings of this and previous studies pointing to poor insight into neurocognitive symptoms, it may be time for psychoeducation to start including a discussion of cognition.

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Eli Lily Investigator Initiated Trial, Principal Investigator: A.M.

## Appendix A

### Measure of Insight into Cognition—Clinician Rated

#### Measure of Insight into Cognition Clinician Rated (MIC-CR)

Sample question:

#### 1. Awareness of trouble listening and paying attention

- |   |   |
|---|---|
| 0 | Can not be assessed/item not relevant   |
| 1 | <u>Aware</u> : Subject clearly believes that s/he has trouble listening and paying attention                          |
| 2 |   |
| 3 | <u>Somewhat</u> : Is unsure as to whether s/he has trouble listening and paying attention, but can entertain the idea |
| 4 |   |
| 5 | <u>Unaware</u> : Believes that s/he does not have trouble listening and paying attention                              |

#### 1a. Attribution: How does the subject explain this experience?

- |   |   |
|---|---|
| 0 | Cannot be assessed/item is not relevant   |
| 1 | <u>Correct</u> : Symptom is due to a mental disorder  |
| 2 |   |
| 3 | <u>Partial</u> : Unsure, but can consider the possibility that it is due to a mental disorder |
| 4 |   |
| 5 | <u>Incorrect</u> : Symptom is unrelated to a mental disorder                                  |

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